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Zambian Breweries Grant Inception Report

Submitted to
Millennium Challenge Corporation

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I. Introduction

This design report is an updated evaluation design of the Zambian Breweries "Manja Pamodzi" social responsibility project. The project's main goal is to create a sustainable collection-and-recycling value chain for postconsumer packaging waste in Lusaka, thereby bringing a cleaner environment. This will be accomplished by reducing the amount of waste in the streets that clogs infrastructure, reducing the amount of recyclable material that ends up being burned or in landfills, and at the same time generating jobs. Manja Pamodzi was awarded the Phase I Innovation Grant by Millennium Challenge Corporation (MCC), through its local Millennium Challenge Account Zambia (MCA).

This project started in late 2015 and it is now in its fifth quarter with three major components: capacity building for solid waste collectors and aggregation sites, district clean-up programs, and education for adults and school children. The project is now active in the eight target peri-urban areas of Chawama, Kamwala, Chunga, Matero, Lilanda, Mutendere, Kalikiliki, and Ngombe. All activities will be completed by February 2018.

As one of the first formal recycling programs in southern Africa, Manja Pamodzi represents an important case study and learning opportunity, leading to an understanding of what worked and what didn't, informing future recycling programs and feeding into the design of future phases of the Manja Pamodzi project. MCC contracted the American Institutes for Research (AIR) to propose and design an evaluation of the project in order to achieve solid learning and evaluation lessons.

MCC and AIR signed a contract for evaluating this study in the late third quarter (Q3), in 2016. Although the impossibility of collecting baseline information limits the scope for a rigorous impact evaluation, there is still substantial time to conduct an in-depth performance evaluation of intermediate outcomes, testing the assumptions, unveiling mechanisms behind the theory of change and understanding what worked, what didn't, how, and why.

This study will be a mixed-methods performance evaluation that includes qualitative and quantitative components, with research questions rooted in the theory of change. This evaluation will include context analysis, program activities, outputs, and mechanisms connecting activities with outputs and outputs with outcomes. We will also explore changes in outcomes, although we will not be able to rigorously evaluate the impact of the program on them.

The protocol for this evaluation is as follows: We will first describe the setting and conduct a literature review, and then present the theory of change. We will then state the research questions and describe the methods used to respond to these questions. Finally, we will discuss ethical considerations and present a work plan.

II. Setting

Lusaka, the dense urban capital of Zambia, generates approximately 900 tons of waste a day. In peri-urban Lusaka, waste is supposed to be collected by community-based enterprises (CBEs), which in turn are funded by the households that they represent. However, the existing system is not functional because it is a purely user fee–based system and the fees are too high.

Furthermore, what waste is collected by CBEs often is not removed by the Lusaka City Council. This results in overfilled waste bins, reducing the utility of further waste collection. Fifty percent of waste ends up on streets and ultimately clogs the sewage and water systems or is burned and pollutes the air.[1] The health and environmental impact is dire. Improper waste management attracts disease vectors, air pollution, and leachate that enter the water table.

The Millennium Challenge Corporation, through its local MCA Zambia, is making extensive investments in water and sanitation, bringing water and sewage pipes to several peri-urban areas in Lusaka, to serve the rapidly growing population. However, the effectiveness of these investments in threatened by the quantity of waste clogging and compromising the infrastructure and polluting the water.

TrashBack, Zambian Breweries' partner, determined that more than 34% of waste accumulating in the streets and drains can be recycled, and that a substantial component of that waste is either polyethylene terephthalate (PET) bottles or cartons, packaging from Zambian Breweries' products. There is a small, informal system of individuals or groups collecting recyclable waste to sell to existing recycling markets. However, people collecting recyclable material are too few in number, face safety risks, lack a regular income, and use ad hoc and inefficient systems in their work.

Given these significant impediments to waste management, Zambian Breweries proposed implementing a comprehensive and sustainable recycling incentive program. The project sensitized, trained, and built capacity for a cadre of self-employed collectors; it also set up a system in which collectors can reliably receive pay for the recyclables they bring in. Aggregation plants collect and pay for the recyclables, and contact the processors when there are enough recyclables to pick up. Education and incentivization campaigns help create the demand for individuals to become collectors and sensitize the public to the importance of waste management.

So far, Zambian Breweries has conducted education and incentivization campaigns in all eight target areas: Chawama, Kamwala, Chunga, Matero, Lilanda, Mutendere, Kalikiliki, and Ngombe. There are currently 158 active collectors, 8 aggregators, and 2 processors. The project is ongoing, but all activities will be concluded in February 2018.

III. Literature Review

There is a dearth of critical evaluations of postconsumer waste-recycling programs in Lusaka and other Sub-Saharan African cities. While there is evidence of inadequacies and inefficiencies in the recovery of postconsumer waste in Lusaka, there has been little documented success in rectifying the issue (Gunsilius et al. 2011; Scheinberg, Simpson, & Gupt, 2010). Despite the lack of rigorous evidence on the effectiveness of large-scale recycling programs in developing countries, there are several examples of success using informal workers to increase cities' recycling efforts (Scheinberg et al.). The city of Lima, Peru, has been successful following a model similar to that of Belo Horizonte, Brazil, in which informal waste collectors are formally organized and supplied with recycling equipment (Dias, 2000). In a similar manner, recycling prototypes in India have experienced far-reaching success and are quickly gaining popularity in the region. The case of Pune, India, provides a strong argument for using informal waste

[1] According to proposal submitted by Zambia Breweries

collectors to increase recovery of postconsumer waste. Recovery efforts in Pune reached nearly 118,000 tons under this newly adopted model (Scheinberg et al.). Recycling initiatives that make use of the informal sector are widely believed to be the answer to the growing solid waste problem in developing countries (Medina, 2000; Troschinetz & Mihelcic, 2009). Zambian Breweries proposes a similar initiative in its efforts to increase recovery of postconsumer waste products in Lusaka using informal waste collectors.

Current literature surrounding recycling efforts in developing countries focuses heavily on the "practical and direct factors influencing the institutions and elements associated" with solid waste management (Troschinetz & Mihelcic, 2009). This "direct" approach to examining the state of recycling in developing countries fails to acknowledge the gravity that "indirect motives" have on decision-making behavior related to conservation. Although research on decision-making behavior associated with recycling is largely ignored in a developing-world context, current literature surrounding the promotion of best health and environmental practices can be used as a reference to explore the promotion of behavior change in recycling. Zambian Breweries aims to encourage community-level behavior change related to recycling through education programs. The evaluation of Zambian Breweries' efforts in Lusaka could add to the limited pool of research on the overall effectiveness of large-scale recycling programs in a Sub-Saharan context. In addition, this research will provide insight into the promotion of recycling-related behavior change in the developing world.

Zambian Breweries proposes to increase the efficiency of waste collection in Lusaka by streamlining collection logistics; creating more collection sites; and using one-time, informal waste collectors in an organized way. This organized effort will foster a sustainable value chain by creating and maintaining jobs in the low-income communities of Lusaka. Research on informal waste collectors has shown that even small-scale organization increases collectors' efficiency (Wilson, Velis, & Cheeseman, 2006). Across the developing world, residents of low-income neighborhoods rely heavily on informal waste collection (Medina, 2000). Some 91% of individuals residing in low-income communities may rely completely on waste collection for their income (Scheinberg et al., 2010). The low-income communities of Lusaka offer the vast and sustainable pool of potential workers that Zambian Breweries needs to succeed in its efforts (Wilson et al.). To meet the waste collection needs of western Lusaka, Zambian Breweries will tap into these underutilized communities, which will create 1,000 new jobs over the course of 5 years. In addition, Zambian Breweries moves to increase efficiency by allocating safety equipment and waste collection aids to its workers. Research on unorganized waste management across the developing world has revealed that a lack of safety and health protocols leads to substantially lower worker productivity because of injury and illness (Wilson et al.; Gunsilius et al., 2011). Zambian Breweries will actively address these challenges by providing its waste collectors with safety training, protective clothing, and collection aids. TrashBack's waste collection initiative in South Africa has also proved successful, with top collectors increasing their weekly collection averages from 1 to 4 tons because of TrashBack's added support (TrashBack, 2014).

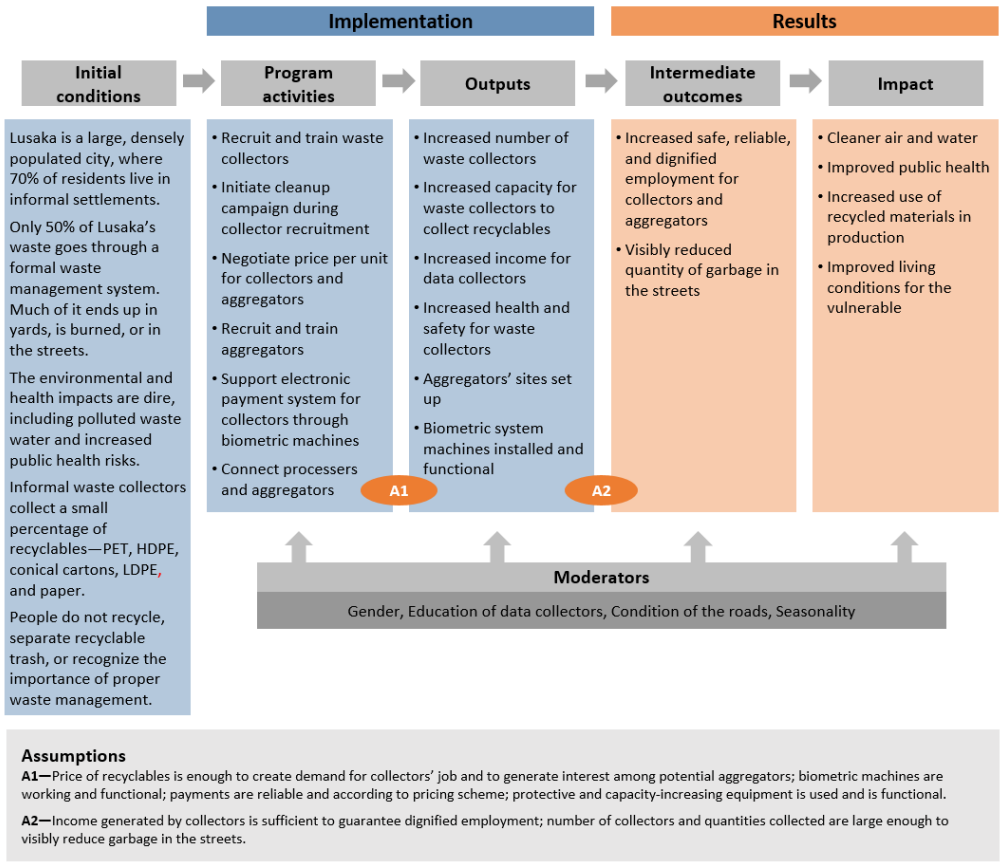
To maintain a sustainable value chain for postconsumer waste, Zambian Breweries is also committed to promoting behavior change at Lusaka's household level. The company proposes to spearhead education efforts focused on recycling through district-level cleanup projects and education programs in Lusaka's schools. The district-level cleanup projects will act as platforms for the dissemination of optimal recycling habits in an effort to promote behavior change at the

household level. Similar dissemination efforts have proved to be successful in promoting behavior change. One example of this is the hand-washing education program in the Chittoor district of India, which experienced increased levels of hand washing after the education campaign (Biran et al., 2014). Furthermore, education initiatives geared to promoting conservation-friendly behavior have a long history of success throughout Sub-Saharan Africa. The United States Agency for International Development's energy efficiency program in Accra, Ghana, experienced great success in promoting electricity conservation through its education efforts in the city's schools (The World Bank Group, n.d.). Zambian Breweries has the potential to experience similar success in its education efforts in Lusaka's schools through children's encouragement of their parents to change their recycling-related behavior.

Theory of Change

AIR believes that policy-relevant research should be built on a theory of change that maps out the causal chain of activities, outputs, intermediate outcomes, and impacts underlying the theory. Thus, we developed a theory of change to motivate our study design of the Zambian Breweries program, which seeks to create a sustainable collection and recycling value chain. Our theory of change encompasses the reasons for the interventions, the program activities to address challenges, the tangible outputs, intermediate outcomes, and impacts. Figure 1 shows the theory of change that motivates our proposed design for the performance evaluation, and it was validated on inception by MCC and Zambian Breweries.

Figure 1: Theory of Change



The theory of change that AIR developed begins with initial conditions of Lusaka's population and current waste systems. The next phase presents the program activities. The Zambian Breweries program intervention recruits and trains waste collectors and builds their capacity, conducts district cleanup campaigns, negotiates price per unit of recyclables, supports electronic payment system for collectors through biometric machines, and connects processors and aggregators.

A number of assumptions may prevent a direct link between program activities and outputs. First, the price of recyclables is assumed to be high enough to create demand for the collector or aggregator job. Also, the biometric machines are assumed to be working and functional, and payments made reliably and according to pricing scheme. In addition, the protective equipment and remaining equipment, such as carts that allow collectors to collect at a higher capacity, are available, accessible, and used by the collectors. When these assumptions hold true, the program activities will lead to outputs: increased number of waste collectors, increased capacity for waste collectors to collect recyclables, increased income for data collectors, and increased health and safety for waste collectors; also, aggregators sites will be set up and biometric machines installed and functional.

On the collectors' side, under the condition that the income generated by collectors is sufficient to guarantee increased livelihood, the program will lead to increased safe, reliable, and dignified employment for collectors and aggregators. On the environmental side, under the condition that the number of collectors and quantities they collect is large enough to visibly reduce garbage in the streets, the program will lead to a visibly reduced quantity of garbage in the streets. This will lead to the impact of the program: cleaner air and water, improved public health, increased use of recycled materials in production, and increased livelihood for community members.

The impact of the project may be stronger or weaker depending on the conditions in the community and of the collectors. The factors that can exercise this influence are known as *moderators*. On the collectors' side, potential anticipated moderators include gender, socioeconomic status, education level, and distance to the aggregator. Moderators at the intervention-area level include condition of the roads, presence and involvement of a CBE, and seasonality.

Research Questions

The primary aim of this project is to conduct a thorough performance evaluation of program activities, assumptions, mechanisms of change and outputs of the theory of change. It is important to understand the fidelity of program implementation to learn whether program delivery deviated from the original plan and how these deviations might have affected impacts. The performance evaluation will respond to the question of how the process of waste collection is working at the collector and aggregator levels specifically.

The performance evaluation is divided into the areas of (a) start-up process; (b) community campaign, outreach, and experience; (c) collectors' recruitment and experience; (d) aggregators recruitment and experience; and (e) processors' capacity and needs.

Manja Pamodzi already has a robust monitoring and evaluation (M&E) system, supported by biometric machines that routinely record payments made to collectors in exchange for recyclables, as well as the weight of recyclables brought in by each collector. These data will constitute the starting point of the evaluation and critical contextual information, as replication of what being already collected via the monitoring of the project is beyond the scope of this project.

Because of the lack of baseline and the limited number of collectors, the scope of the outcome analysis for collectors is a descriptive one rather than an impact one. A rigorous impact evaluation to understand how much would current collectors be gaining had the program not been implemented will not be possible for this study. There are currently approximately 160 collectors in the 8 intervention areas of which only 20% dedicated full time, so only approximately 30 collectors full time. This number is too small for any impact evaluation. The lack of baseline further limits the scope of the evaluation because it dramatically reduces the credibility of all of the feasible quasi-experimental methods. However, we will be investigating descriptively how the collectors spend, save and invest the income from the collectors, collecting their salary history from all the recent jobs to compare the income that they get as collectors to other similar jobs that they have had in the past, and investigating perceptions of stigma and dignity of the job.

The environmental outcome analysis is similarly descriptive, both because of the lack of baseline and because 8 areas are too little for an impact evaluation. The analysis will be mostly qualitative but complemented with direct observations: we will be asking collectors the types of location they tend to collect recyclables from, and then observe environmental hazards associated with accumulation of waste in these locations. This is the very first step in the direction of identifying the impact of waste accumulation on health: are collectors contributing to reducing waste in locations where waste is otherwise clogging the sewage? How is the non-collected waste usually managed in those locations, is it burned or let accumulating? We will also interview community leaders asking, qualitatively, their perceived change in waste accumulation since the program started.

Performance Evaluation of the Manja Pamodzi Project

a) Start-up process

- What was the process of working with relevant stakeholders in starting up the program?
- How was the price set?

b) Community campaign, outreach, and experience

- How did Zambian Breweries conduct community cleanup sensitization where waste collectors were recruited, and to what extent were communities being sensitized to the benefits of recycling?
- What messages were used during the campaign? Which were perceived to be emphasized? And which were perceived to be more effective?

- How has the Manja Pamodzi program engaged with schools to encourage effective waste management practices?

c) Collectors' recruitment and experience

- How did Zambian Breweries conduct recruitment, training and capacity building of collectors?
- What program gaps existed that discouraged waste collectors from joining and from becoming dedicated collectors?
- What types of people are interested in becoming collectors, and what types of people are likely to continue being successful collectors? What are the characteristics associated with being successful and productive? How does it differ between women and men?
- What has been waste collectors' experience in collecting recyclables? How does it differ between women and men?
- What does a typical day of waste collection look like? What processes could be improved to make the collectors' experience more productive?
- How many Kgs of recyclables were collected since the beginning of the program? Since the past 6 months? In the past month? Who

d) Aggregators recruitment and experience

- How were aggregators' sites set up? Who signed up to be aggregators? How were aggregators supported by the Manja Pamodzi program?
- How effective do the aggregators find the biometric machines? What are the main challenges experienced during the process of receiving recyclables from collectors?
- What are the main challenges experienced during the process of transferring waste from aggregator plants to processor plants?
- What is the current price and how has it changed?

e) Processors' capacity and needs

- How has Manja Pamodzi changed the demand for recyclables and for recyclables' by-products?
- Are processors able to receive enough sorted plastic and paper, and do they have the capacity to receive enough?
- What is the current price and how has it changed?

Outcome analysis: collectors' income and livelihood

- How do collectors spend and use the income coming from sale of recyclables? How does it differ between women and men?
- What does the employment and income history look like for collectors, before and after they became collectors?

- In terms of income, what kinds of jobs is a collector's comparable to, given the setting and the profile of the collector's job? How does it differ between women and men?
- What are the perceptions of the dignity of the job among community members and among collectors? How does it differ between women and men?

Outcome analysis: waste in the environment

- Where are recyclables mostly collected? What types of places, and what are the hazards associated with accumulation of waste in those places?
- What is the perceived change of the program on waste accumulation?

IV. Methods

The research questions are approached with mixed methods that include both qualitative and quantitative techniques. Qualitative methods include focus group discussions (FGDs) and key informant interviews (KIIs), while quantitative methods include a survey administered to collectors and a time and motion exercise. These data are complemented by programmatic data coming from meetings with Zambian Breweries program staff and Zambian Breweries procedures documentation.

The table below matches each of the questions with the method employed to respond to that question, and with the type of data collection and timing. In the rest of the section, we delve in more detail into the approach taken for each of the questions.

Exhibit 1. Summary of methods used to respond to key questions in the process evaluation

Key Content Area to Explore	Methods					Informants
	Qualitative		Quantitative		Programmatic	
	FGD	KII	CS	T&M		
a) Start-Up process						
• What was the process of working with relevant stakeholders in starting up the program?		✓			✓	ZB, MCA, processors, CBE, local leaders
• How was the price set?		✓			✓	
b) Community campaign, outreach, and experience						
• How did Zambian Breweries conduct waste collector community clean-up sensitization, and to what extent were communities being sensitized on the benefits of recycling?	✓	✓			✓	Collectors, ZB, community leaders
• What messages were used during the campaign? Which were perceived to be emphasized? And which were perceived to be more effective?	✓	✓				Collectors, ZB, community leaders

Key Content Area to Explore	Methods					Informants
	Qualitative		Quantitative		Programmatic	
	FGD	KII	CS	T&M		
• How has the Manja Pamodzi program engaged with schools to encourage effective waste management practices?		✓				Community leaders (head teacher only), ZB
c) Collectors' recruitment and experience						
• How did Zambian Breweries conduct recruitment, training of collectors and capacity building?	✓	✓	✓		✓	Collectors (active, dropout, dedicated); ZB
• What program gaps exist that discourage waste collectors from joining and from becoming dedicated collectors?	✓	✓	✓		✓	
• What types of persons are interested in becoming collectors, and what types of persons are likely to continue being successful collectors? What are the characteristics associated with being successful and productive?	✓		✓			Collectors (active, dropout, dedicated);
• What has been waste collectors' experience in collecting recyclables?	✓		✓			
• What does a typical day of waste collection look like? What processes could be improved to make the collectors' experience more productive?				✓		Collectors, active
d) Aggregators recruitment and experience						
• How were aggregators' sites set up? Who signed up to be aggregators? How were aggregators supported by the Manja Pamodzi program?		✓			✓	Aggregators, Zambian Breweries,
• How effective do the aggregators find the biometric machines? What are the main challenges experienced during the process of receiving recyclables from collectors?	✓	✓	✓		✓	Collectors, aggregators
• What are the main challenges experienced during the process of transferring waste from aggregator plants to processor plants?		✓				Aggregators, processors
e) Processors' capacity and needs						

Key Content Area to Explore	Methods					Informants
	Qualitative		Quantitative		Programmatic	
	FGD	KII	CS	T&M		
• How has Manja Pamodzi changed the demand for recyclables and for recyclables byproducts?		✓			✓	Processors, by-product buyers
• Are processors able to receive enough sorted plastic and paper?		✓				Processors, by-product buyers
Outcome analysis	**FGD**	**KII**	**CS**	**T&M**		
a) Collectors' income and livelihood						
• How do collectors spend and use the income coming from sale of recyclables?	✓		✓			Collectors (active, dropout, dedicated);
• What does the employment and income history look like for collectors, before and after they became collectors?	✓		✓			Collectors (active, dropout, dedicated);
• In terms of income, what kinds of jobs is a collector's comparable to, given the setting and the profile of the collector's job?	✓		✓			Collectors (active, dropout, dedicated);
• What are the perceptions of the dignity of the job among community members and among collectors?	✓		✓			Collectors (active, dropout, dedicated);
b) Waste in the environment						
• Where are recyclables mostly collected from? What types of places, and what are the hazards associated with accumulation of waste in those places?	✓				✓ (direct observations)	Collectors; direct observations from researchers
• What is the perceived change of the program on waste accumulation?		✓				Community leaders

Acronyms: FGD = focus group discussion, KII = key informant interviews, CS = survey of collectors, T&M = time and motion, ZB = Zambian Breweries, MCA = Millennium Challenge Account Zambia, CBE = community-based enterprise.

Qualitative Methods

Key informant interviews

A key informant is a person who possesses expert knowledge about the program or a topic related to the program. Key informant interviews allow participants to reflect freely on interview topics and share challenges faced in the process of program implementation. For this research,

we propose using a semistructured interview guide that focuses closely on topics pertinent to each category of key informant. We will conduct KIIs with Zambian Breweries program staff; aggregators; processors; by-products buyers; and community leaders, including head teachers, neighborhood health committee chair, and one more person recommended by the neighborhood health committee chair. We choose not to preselect the informants because each community has a different dynamic, and leaders and advocates may vary in their roles. We will utilize the local knowledge to discover who the best informants are.

KII with Zambian Breweries will, first, be around their planning; set-up of the program; main challenges encountered; ways to engage the stakeholders and communities in negotiating prices for recyclables. They will also be prompted for broad recommendations for other organizations interested in setting up a similar program especially at the planning stage and at the stage of engaging community and stakeholders. The goal is to document the start-up process to provide a case study for other organizations interested in similar work. The interview will then be around the community campaign, outreach, and experience, including the education campaign for promoting sorting in schools: how was it set up, what were the challenges and what were the lessons and the perceived spirit of the event and motivation of community members. We will then ask about the training of collectors and lessons on and recommendations for recruitment, motivation, and retention of collectors.

KII with MCA will mostly be around the set-up process, including procedures, lessons, and recommendations. MCA will also be asked about perceptions, challenges, and successes encountered with the Manja Pamodzi study regarding engagement of stakeholders, institutional and political support, sustainability, innovations, and logistical challenges.

KII with community leaders will serve as our window into the community and its perception regarding the project, the knowledge of the project in the community, the community's perceived need and support for the project. They will be asked questions about the start-up process, community campaign and outreach, perception of collectors, and perceived barriers to entry.

KII with aggregators and processors will help us understand the demand side of the market, to understand the way the process of having intermediate aggregators is working, the satisfaction of processors, challenges, successes, and lessons.

KIIs with recyclable by-product buyers to explore what (and how much) they are purchasing from the processors, as well as how often they work with processors. Discussions with by-product buyers will provide insights relevant to the sustainability and overall scalability of this program. This will contribute to our understanding of whether the program is sustainable and scalable within Zambia.

Focus group discussions

Focus group discussions provide a context in which waste collectors and community members feel comfortable and empowered to discuss the evaluation topics with their peers and the carefully trained facilitator. We will create a social dynamic that encourages participants to reflect on their opinions and experiences, and express them verbally. The FGDs are designed to capture data on waste collectors' experiences with the Zambian Breweries Manja Pamodzi

project. Because of the high attrition experienced by Zambian Breweries in recruiting collectors, we are particularly interested in understanding the motivations and challenges behind those who initially signed up to be collectors and got trained but then didn't continue (dropout waste collectors), those who are collectors but only do it occasionally (casual waste collectors), and those who are active and dedicated collectors (dedicated waste collectors).

Under the "community campaign, outreach, and experience" set of questions, we will ask the collectors how they were recruited, how they came to know about the campaign, how they think most people learned about the campaign, and how well known they think the event was. We will also ask what messages drew them to sign up; how clearly they understood the details of what was entailed in becoming a collector, and what their initial perception of the job was as well as what messages they think were more successful; and how they perceived waste management when they first approached the campaign.

Under the "collectors' recruitment and experience" set of questions, we will ask the collectors what they were doing before, how they initially perceived the job, how they were trained and their feedback on the training and capacity-enhancing equipment, their main challenges in doing their job, and their experience and satisfaction with it, as well as the perception of the job by the community. We will explore collectors' daily routines and investigate the daily challenges to and enablers of their work, and ask for feedback and recommendations of what would improve collectors' productivity and satisfaction. We will ask separate target questions to dropout, occasional, and dedicated collectors in order to understand any disconnect between their original intent and their current status as collectors, focusing on factors that can be changed and acted on.

Sample size considerations

With the project already running in all 8 areas, there is no possibility of collecting baseline information for many of our informant types. However, in many cases it is still valuable to have two waves of data collection to understand the ways the perceptions and experiences have changed over time and to learn differences between short-term and long-term lessons, which are critical for sustainability. Collecting at least two data points is also critical to following the outcomes of the collectors.

In cases where informants can be categorized by intervention area, we have selected only three areas from the eight. The choice will be purposeful, and we will choose together with Zambian Breweries and MCA according to the intensity and perceived success of the intervention in each area. We will choose an area that is perceived by them to be particularly successful, one average one, and one perceived to be unsuccessful.

Dropout waste collectors should be interviewed only once; however, we are interested both in the waste collectors who dropped out right after signing up and in those who dropped out after some time. The first group can be recruited immediately and will be included in the first data collection, which we expect in February 2017. The second group can be collected in the second wave of data collection, which we expect approximately 8 months after that, in October 2017.

We would like to interview both casual and dedicated waste collectors in two separate data collections during the program, to understand both short- and long-term lessons. For casual waste collectors, we will conduct one FGD per selected zone, in both the first and the second wave of data collection. The sample for casual collectors does not necessarily need to be longitudinal, but it can be a repeated cross-section with independent sampling and replacement. At the moment, the dedicated collectors are only 20% of the approximately 160 total collectors: 32 collectors in total in the 8 zones. The small number means that we will not be able to conduct one focus group per area, but since the dedicated collectors' experience is particularly important, we plan to combine the zones and do two FGDs with them in February 2017, and two FGDs 8 months later, one with long-term collectors (at least 6 months' work) and one with a new sample of dedicated collectors, who started less than 6 months before.

Aggregators will be selected from the same three areas and will be interviewed longitudinally in the two data waves; there are currently only two processors; so both will be interviewed in both waves, as will Zambian Breweries and MCA. Community leaders from the three selected zones will also be interviewed twice, for a total of 18 KIIs.

Table 2. Proposed Data Collection Plan

Method	Respondent(s)	Number per intervention area (3)	Total number (per round of data collection)	Total #
FGD	Dropout waste collectors	1 FGD	3 FGDs	6 FGDs
FGD	Casual waste collectors	1 FGD	3 FGDs	6 FGDs
FGD	Dedicated waste collectors	--	2 FGDs	4 FGDs
KII	Aggregators	1 KII	3 KIIs	6 KIIs
KII	Processors	N/A	2 KIIs	4 KIIs
KII	By-product buyers	N/A	6 KIIs	12 KIIs
KII	Zambian Breweries	N/A	2 KIIs	4 KIIs
KII	MCA	N/A	1 KII	2 KIIs
KII	Community leaders: neighborhood health committee chair, head teacher, CBE representative or other community leader suggested by NHC chair and head teacher	3 KII	9KII	18KII

Recruitment of participants

Collectors and aggregators will be recruited from Zambian Breweries logs. Collectors will first be blocked by areas and by status (casual, dedicated) and then randomly selected to participate. Dropout collector contact information is available from the initial recruitment and training logs, and they will be randomly selected to participate.

Participants selected for longitudinal follow-up, will be asked permission and consent to be recontacted during the first data collection wave.

Data collection procedures

Two-person teams will undertake data collection. Wherever possible, one researcher will be responsible for interviewing or facilitating, while the second researcher will have primary responsibility for recording responses. The researchers will digitally record all KIIs and FGDs on portable digital recorders, using an external microphone whenever possible. The researchers will download recordings to laptops each day, renamed according to an anonymized code system held in an encrypted Excel sheet and copied to external media for backup. At the end of each day, the researchers will transcribe the handwritten recording sheets to Microsoft Word documents, translating the material as necessary. Researchers will use audio recordings to supplement and validate the written transcriptions and translations. They will assign all transcriptions new names according to the code system in order to ensure data and informant confidentiality.

Analysis

All data from KIIs and FGDs will be coded and analyzed using the NVivo qualitative software program. Our team will create a preliminary coding outline and structure on the basis of the research questions, interview protocols, and memos of ideas that emerged during data collection. This coding outline serves as the tool for organizing and subsequently analyzing the information gathered in the interviews and focus groups. The outline is a living document that may be modified as new themes and findings emerge during data analysis. A list of definitions for the codes accompanies the outline, so that coders categorize data using the same standards. After inputting the raw data into NVivo, coders select a sample of interviews to double-code, to ensure inter-rater reliability. The team subsequently codes the data into the structure. Using this coded data, the qualitative team uses grounded theory to identify themes, categories, and theories that emerge from the data and that confirm or refute the researchers' initial impressions. That is, rather than basing the analysis on a hypothesis, the researchers create concepts and categories based on the data, refining the concepts as they go along to eventually inform the overall findings. During this process of data reduction, researchers characterize the prevalence of responses, examine differences among groups, and identify key findings and themes related to the research questions.

Quantitative Methods

Time-and-motion study

Time-motion studies (Lopetegui et al., 2014) consist of following participants through the flow of their activities to identify the way time is allocated across the different activities in a day, and to identify potential bottlenecks and root causes of delays and low productivity. In research, time-and-motion studies are mostly used in health care settings to either conduct microcosting or to improve efficiency of health care delivery (Deo et al., 2012; Alamo et al., 2012, for examples in Zambia). AIR proposes to conduct a similar time-and-motion study for a selected small and

purposeful sample of collectors. We will follow a dedicated collector for an entire day of work and log in all the activities in which she or he engages, and log in the time spent in reaching the place of collection, the time spent actually collecting, the time spent transporting, the time spent sorting, and so on. This will help us understand whether the protective and capacity-enhancing equipment is suitable for facing their challenges, and to understand the processes to target in order to improve productivity of the collectors with the same effort. The findings will potentially help target investment and identify small changes that could substantially improve productivity and, hence, the income of collectors.

Sample size considerations

We will follow six dedicated waste collectors during the both rounds of data collection. While this method is defined as quantitative, the sample size selection procedures make it more comparable to a qualitative study in which the sample size is dictated not by its representativeness but by its depth and insights. The sample size is limited to dedicated waste collectors because the aim of this activity is to understand ways to increase productivity.

Data collection procedures and recruitment

We will recruit the sample of six dedicated waste collectors from the participants of the dedicated FGD collectors.

Analysis

Each activity will be logged into a paper tool, and each activity will have a code. The researchers will log in and out each activity, and record start and end time. The data will then be transferred into Excel. The percentage of total work time dedicated to each coded activity will be calculated and displayed.

Collectors Survey

We plan to administer a survey to all waste collectors in all intervention areas with the aim of (a) understanding what characteristics are associated with successful collectors; (b) describing the ways in which the money from the waste collection is spent, used, and invested, and how it affects the overall income and expenditure of the entire household, with a particular focus on gender; (c) describing what types of jobs these waste collectors were previously engaged in, and therefore giving us a benchmark of what could be the income for comparable jobs, d) describing the perception around dignity of the job. The M&E data already captures income of collectors, but the survey will go beyond the raw number to understand income, expenditures, self-reported life satisfaction, aspirations, mental health, and economic and psychological needs, as well as the ways this money is used and invested, what fraction of the household and individual income this money represents, and how—if at all—it is changing women's lives.

The survey will ask respondents about their demographic and household situation including education, household roster, food security, self-reported health, assets and water, sanitation arrangements in their house. The survey will also include an expenditures-and-household-income section; a salary history,for the collector and number of days and hours spent in each job,

including the collector one, intra-household allocation of money deriving from collecting recyclables; and a section inquiring into motivation, locus of control, self-esteem, and perceived stigma of being a collector. It will also include a process evaluation component on training experience, challenges preventing higher productivity in collecting.

Data collection and recruitment procedures

All waste collectors will convene at a central location in each intervention area to participate into the study. Collectors will receive a transport reimbursement of 20,000 kwacha. Researchers will contact by phone those who cannot be located or are missed during this data collection, and the will make an appointment to administer the survey either at the collectors' houses or at the collection point. The team will attempt to reach collectors who have moved out of the intervention area or who are not traceable by phone; however, if this attempt is unsuccessful, they will be excluded. The team will collect all data on smartphones so it is electronically captured. Smartphones will be password protected, and data will be encrypted and kept in a secure server until downloaded and removed from the server at the end of each data collection wave.

Sample size considerations

There are currently 160 collectors and we can expect optimistically to have 400 collectors one year from now with substantial heterogeneity across them, with some working full time and some collecting recyclables only occasionally, some just starting and some with already a few months of experience. We propose to interview the entire population of collectors rather than a sample of them given the relatively small number of potential participants, their heterogeneity, and the uncertainty around the final number of collectors.

All collectors will be interviewed in both the first and the second data collection wave. There are currently approximately 160 collectors in the eight areas, and all will be contacted. The first survey will take place in February 2017. The second data collection will take place in October 2017. All collectors who participated into the first data collection will be retraced and re-interviewed as long as they are still residing in the same intervention area, regardless of whether they are still collectors. In addition, every collector who has been recruited after the sampling for the first data collection will be included in the second data collection. In total, we expect approximately 400 collectors at the second data collection.

We conducted a precision-based sample size calculation. Our chosen outcome was a 3-items hunger scale validated in similar settings in sub-sahran Africa (McCoy and others, 2015)[2] and currently used successfully in research in Zambia. Using preliminary data on this scale, we believe that at least 70% of households living in peri-urban Lusaka compounds might be considered food insecure (source from ongoing study on economic

[2] The questions are: "In the past [4 weeks/30 days], did you or any household member go to sleep at night hungry because there was not enough food?", "In the past [4 weeks/30 days], did you or any household member go a whole day and night without eating anything at all because there was not enough food?" and "In the past [4 weeks/30 days], was there ever no food to eat of any kind in your house because of lack of resources to get food?"

needs of HIV patients in Lusaka). A sample size of 400 collectors would allow us to estimate the outcome with a confidence level at 95%, a precision at 0.05, and a design effect of 2.

Analysis

We will display data using simple descriptive statistics and create infographics for it. All analysis will be done in STATA. We will use ordinary least squares and logit models for all multivariate analysis.

V. Ethical Considerations

Ethical Approval

AIR will obtain ethical approval from its own internal Institutional Review Board (IRB) as well as locally in Zambia. AIR will provide MCC with documentation of both ethical approvals prior to commencing data collection.

Consent

All participants will need to provide written informed consent before participating in any quantitative or qualitative data collection exercise. Participants who are younger than 18 years of age will complete an informed assent and will then be required to seek parental consent, as well. The information sheet and informed consent documentation is attached at the end of this protocol. We will obtain informed verbal consent from each participant after reading the consent form aloud and ensuring that the participant has understood.

Potential Risks

We believe that this study carries no more than minimal risks. In the key informant interviews, we anticipate potential fear of revealing confidential information about the program. In the survey and in the time-and-motion study, we anticipate only a minimal risk of embarrassment and a minimal risk of breach of confidentiality.

Benefits

There are no direct, immediate benefits to the collectors or to the community members who are interviewed. Program implementers' benefits will be knowing what components of the program were most successful and implemented well, and which ones were not. This is information that can be used to improve efficiency of delivery.

Assurances of Confidentiality

The study will protect confidentiality by a number of methods. First, all staff members will be trained and certified in ethical conduct of research. Second, we will not identify any individual household or member by name in any report or publication about this study. We will not share

specific information about a household with anyone outside the research team. We have developed data-handling procedures to safeguard completed forms. Each participant will be assigned a unique identification code that we will use to link participant records across modules and survey rounds. After we enter the data, we will encrypt and password-protect the complete data file.

Procedures will require an anonymized data set, which strips away any identifying information, and this anonymized data set must be used for all analysis. The file connecting identification numbers and associated names will only be accessible to AIR key researchers and will be destroyed at the end of the study. All AIR computers are encrypted and password-protected.

VI. Work Plan

We present below the general Gantt Chart and, below, a more detailed breakdown of all tasks and human resources allocated to each task.

Table 3: Gantt Chart

Tasks *Subtasks*	**Project Year 1**												**Project Year 2**											
	Dec 16	Jan 17	Feb 17	Mar 17	Apr 17	May 17	June 17	July 17	Aug 17	Sept 17	Oct 17	Nov 17	Dec 17	Jan 18	Feb 18	Mar 18	Apr 18	May 18	June 18	July 18	Jun 17	July 17	Aug 17	Sept 17
Inception																								
Study design																								
Instruments																								
First round data collection																								
Enumerator training																								
Data collection																								
Data entry/ transcription																								
Analysis																								
First draft process evaluation report																								
Presentation of results																								
Second round data collection																								
Enumerator training																								
Data collection																								
Data entry/ transcription																								
Analysis																								
Reporting																								
Presentation of results																								

Tasks *Subtasks*	Project Year 1												Project Year 2											
	Dec 16	Jan 17	Feb 17	Mar 17	Apr 17	May 17	June 17	July 17	Aug 17	Sept 17	Oct 17	Nov 17	Dec 17	Jan 18	Feb 18	Mar 18	Apr 18	May 18	June 18	July 18	Jun 17	July 17	Aug 17	Sept 17
Final evaluation report																								

Table 4: Workplan by task

Task	Time period (working days)	Team	Outputs
Remaining inception stage tasks			
Finalize qualitative instruments	April 3 – 14, 2017	HR, CN, MM	Qualitative protocols
Finalize collectors survey and time and motion	April 3-14, 2017	AZ, MM	Survey and time and motion tools finalized
IRB Social Sciences submission	April 10- 21, 2017	AZ, MM, HR, CN	IRB approval obtained
Approval from relevant Zambian Ministry	April 10 – 21, 2017	AZ	Written approval obtained
Data collection			
Baseline			

Identification of FGD and KII participants	Week of April 24-28, 2017	MM	Community leaders identified, FGD participants selected and appointments scheduled
Contacting collectors and making appointments	Week of April 24-28, 2017	Quantitative Research Assistant, AIR	Collectors contacted and appointments made
Qualitative data collector training (Wave I)	Week of April 24-28, 2017	CN leading, MM, 2 qualitative researchers from Palm Associates	Data collectors trained
Quantitative data collector training (Wave I)	Week of April 24-28, 2017	AZ leading, AIR Research Assistant and 6 Palm quantitative enumerators.	Enumerators trained
Data collection: FGDs and KIIs, including time and motion and environmental outcomes	Weeks of May 8-19, 2017	MM, CN, 2 qualitative researchers from Palm Associates	FGDs and KIIs conducted
Data collection: collectors survey	Weeks of May 8-19, 2017	AZ leading, AIR Research Assistant and 6 Palm quantitative enumerators	Survey data collected
Transcription	May 19 – June 9, 2017	Qualitative researchers from Palm Associates	Transcripts of FGDs and KIIs delivered on a rolling basis during this period
Data analysis, quantitative	June 9-30, 2017	AZ leading, AIR research assistants	Data analyzed and tables created

Data coding and analysis, qualitative	June 9-30, 2017	HR, MM, CN	Coded data in NVivo
Draft Wave I Evaluation report	August, 2017	MM, CN, AZ, HR	Draft report delivered to MCC
Presentation of results	September, 2017	AZ, CN, HR, MM	Presentation in Lusaka delivered to MCA-Zambia, Zambian Breweries
Endline			
Identification of FGD and KII participants	March-April, 2018	MM	Community leaders identified, FGD participants selected and appointments scheduled
Qualitative data collector training (Wave II)	April, 2018	CN leading, MM, 2 qualitative researchers from Palm Associates	Data collectors trained
Qualitative data collector training (Wave II)	April, 2018	AZ, Quantitative Research Assistant, AIR	
Data collection: FGDs and KIIs	April-May, 2018	MM, CN, 2 qualitative researchers from Palm Associates	FGDs and KIIs conducted
Transcription	June, 2018	Qualitative researchers from Palm Associates	Transcripts of FGDs and KIIs delivered on a rolling basis during this period

Data collection: collectors survey	April-May, 2018	AZ leading, AIR Research Assistant and 6 Palm quantitative enumerators	Survey data collected
Data coding and analysis, qualitative	June, 2018	MM, CN, HR	Coded data in NVivo
Data analysis, quantitative	July, 2018	AZ leading, AIR research assistants	Data analyzed and tables created
Draft Wave II Evaluation report	August, 2018	MM, CN, AZ, HR	Draft report delivered to MCC
Presentation of results	September 2018	AZ, MM	Presentation in Lusaka delivered to MCA-Zambia, Zambian Breweries
Final Evaluation Report	October, 2018	AZ, MM, CN, HR	Final report delivered to MCC

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Annex A: Informed Consent documentation

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HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

CONSENT FORM

(Translated into vernacular if necessary)

TITLE OF RESEARCH:

REFERENCE TO PARTICIPANT INFORMATION SHEET:

1. Make sure that you read the Information Sheet carefully, or that it has been explained to you to your satisfaction.
2. Your permission is required if tape or audio recording is being used.
3. Your participation in this research is entirely voluntary, i.e. you do not have to participate if you do not wish to.
4. Refusal to take part will involve no penalty or loss of services to which you are otherwise entitled.
5. If you decide to take part, you are still free to withdraw at any time without penalty or loss of services and without giving a reason for your withdrawal.

6. You may choose not to answer particular questions that are asked in the study. If there is anything that you would prefer not to discuss, please feel free to say so.

7. The information collected in this interview will be kept strictly confidential.

8. If you choose to participate in this research study, your signed consent is required below before I proceed with the interview with you.

VOLUNTARY CONSENT

I have read (or have had explained to me) the information about this research as contained in the Participant Information Sheet. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction.

I now consent voluntarily to be a participant in this project and understand that I have the right to end the interview at any time, and to choose not to answer particular questions that are asked in the study.

My signature below says that I am willing to participate in this research:

Participant's name (Printed): …….....……....

Participant's signature: …… Consent Date: …….....

Researcher Conducting Informed Consent (Printed) …….

Signature of Researcher: ……..…….. Date: …….

Signature of parent/guardian: …… Date: ……

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